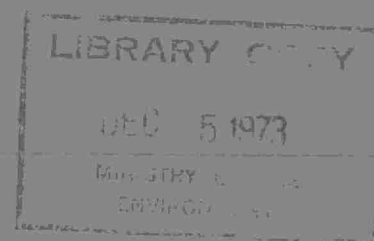


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OPERATING SUMMARY

MARKHAM



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MINISTRY OF THE ENVIRONMENT

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Ontario

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Ministry of the  
Environment

135 St. Clair Avenue West  
Toronto 195, Ontario

We are pleased to present you with the 1972 operating summary for the water pollution control plant serving your community.

This summary contains data on the performance of the plant as well as relevant financial information. Of particular interest is the review of the year's activities in which significant items of these data are discussed in some detail by the operations engineer and his staff who, by their day-to-day involvement with the operation, are thoroughly familiar with the plant.

We appreciate your continuing interest in protecting the environment through the efficient operation of this wastewater treatment facility.

D.S. Caverly,  
Assistant Deputy Minister.

D.A. McTavish, P. Eng.,  
Director,  
Project Operations Branch.

MINISTRY OF THE ENVIRONMENT

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Honourable James A.C. Auld

DEPUTY MINISTER  
E. Biggs

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REGIONAL SUPERVISOR  
P.J. Osmond

OPERATIONS ENGINEER  
A. Clark

135 St. Clair Avenue West  
Toronto 195

MARKHAM  
WATER POLLUTION CONTROL PLANT

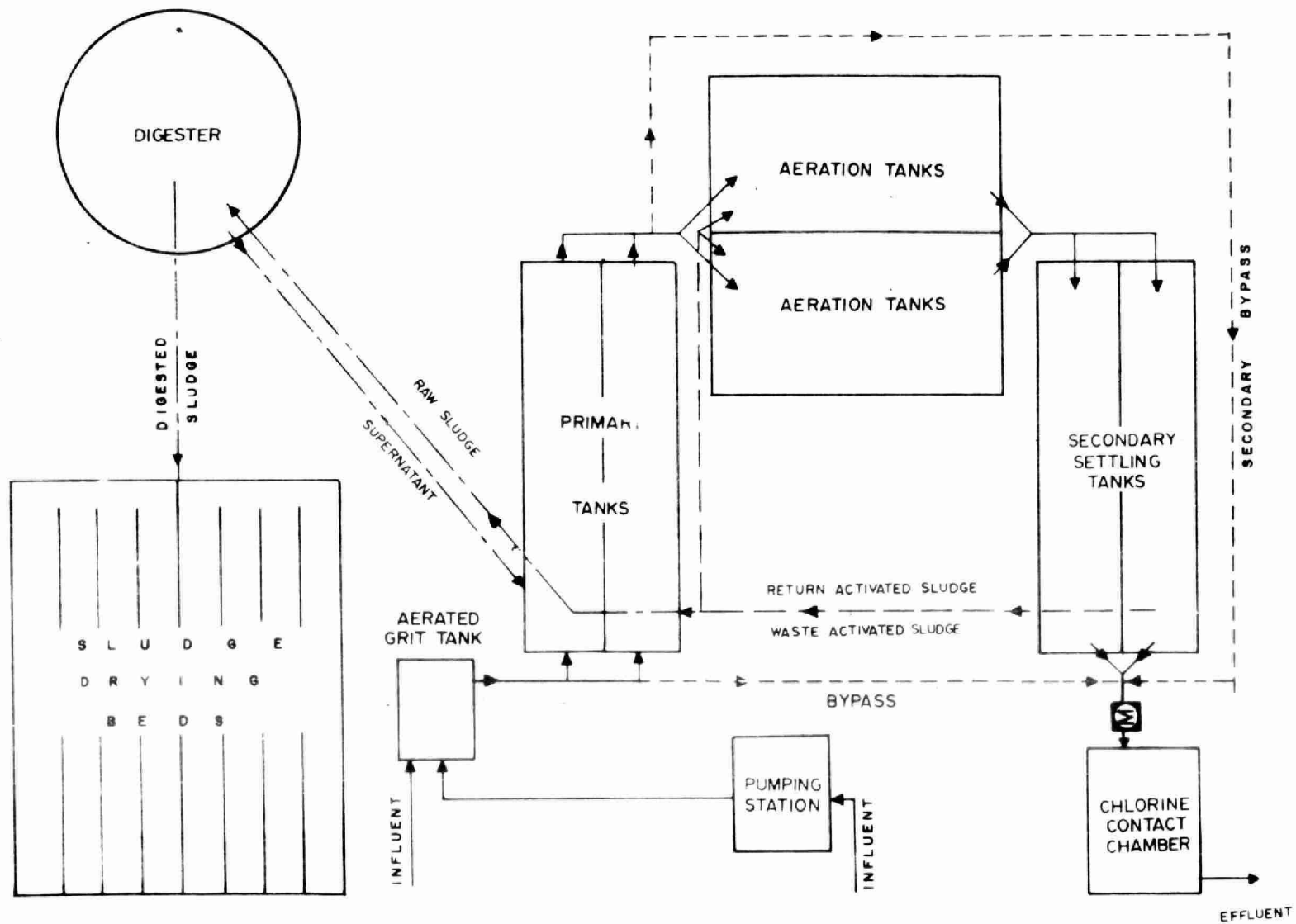
operated for  
THE TOWN OF MARKHAM  
by the  
MINISTRY OF THE ENVIRONMENT

1972 ANNUAL OPERATING SUMMARY

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# TOWN OF MARKHAM WATER POLLUTION CONTROL PLANT



## DESIGN DATA

PROJECT NO. 2-0040-59

TREATMENT Activated Sludge

DESIGN FLOW 0.67 mgd

DESIGN POPULATION 8,000

BOD - Raw Sewage 215 mg/l  
- Removal 95%

SS - Raw Sewage 220 mg/l  
- Removal 95%

### PUMPING STATION

Type: Fairbanks-Morse  
Size: Two 350 gpm @ 40' tdh

### PRIMARY TREATMENT

#### Comminution

Type: C. P. Barminutor  
Size: One 18"

#### Grit Removal

Type: Aerated  
Size: One 13' x 6' x 8.1' swd  
(4,240 gal)  
Retention: 9.2 min

### Primary Sedimentation

Type: Jeffrey  
Size: Two 42' x 12' x 7' 9" (avg)  
(48,800 gal)  
Retention: 1.76 hours  
Loading: Surface, 660 gal/ft<sup>2</sup>/day  
Weir, 27,800 gal/ft/day

### SECONDARY TREATMENT

#### Aeration Tanks

Type: Diffused air, two pass  
Size: One 51'x22'x15' plus one  
51'x28'x15' (38,250 cu.  
ft. or 239,000 gallons

#### Air Supply

Type: Sutorbilt and Aerzen  
Size: One 700 scfm @ 5 psi (standby)  
One 1075 scfm

#### Diffusers

- 72 spargers (17" centre)

### Secondary Sedimentation

Type: Jeffrey  
Size: Two 42' x 12' x 10.5' (avg)  
(66,000 gal)  
Retention: 2.38 hours  
Loading: Surface, 660 gal/ft<sup>2</sup>/day  
Weir, 4,750 gal/ft/day

### CHLORINATION

Type: W & T  
Size: One 70 lb/day

#### Chlorine Contact Chamber

Size: 20' x 11.38' x 8.5' swd (12,080 gal)  
Retention: 26 min

### OUTFALL

- to Exhibition Creek  
(tributary of Rouge River)

### SLUDGE HANDLING

Digestion System - Single-stage

Type: Mixed by recirculation  
Size: One 45' dia x 20' swd (34,240 cu ft  
or 220,000 gal)  
Loading: 0.67 lb/cu ft/ mo

#### Sludge Drying Beds

Size: Four 90' x 20' (7,200 sq ft)

# '72 Review

## GENERAL

The Markham sewage treatment plant with the design capacity of .67 million gallons per day consists of an on-site pumping station, an aerated grit tank, 2 primary sedimentation tanks, 2 aeration tanks, 2 final sedimentation tanks, a chlorine contact chamber, and a single stage digester. Over the past few years phosphorus removal facilities and tube settlers were added to the plant in an attempt to increase the capacity to 1.0 mgd. These however did not prove too successful. The phosphorus removal process was not effective as the primary tanks which are designed for .67 million gallons per day were too small for the flows to the plant which averaged 1.0 million gallons per day. As a result the lime floc would not precipitate in the tanks but was carried over to the aeration section and/or bypassed with the primary effluent when the rate of flow to the plant exceeded .67 million gallons per day.

The tube settlers were not too successful either again because of the hydraulic overload. The use of chemicals other than lime are being considered in a continued attempt to upgrade the capacity.

## EXPENDITURES

The total operating cost for the year was \$45,923.00, \$2,342 more than the 1971 operating cost. Payroll costs were 47 percent of the total budget, sundry cost which includes sludge haulage costs were 23 percent of the total budget and power costs were 13 percent of the total budget.

## PLANT FLOWS AND CHLORINATION

The average daily flow to the plant was 1.0 million gallons, an increase of 0.23 million gallons from 1971. The maximum daily flow to the plant was 2.0 million gallons while the maximum rate of flow to the plant was well in excess of 2.0 million gallons per day.



Flows greater than the hydraulic design capacity of the plant of 0.8 million gallons per day received primary treatment and chlorination only. Bypassing occurred quite regularly.

The final effluent including the flow bypassed after primary treatment was chlorinated throughout the year. A total of 15,950 pounds of chlorine with an average dosage of 4.1 milligrams per litre was used to maintain a 0.5 milligram per litre residual in the effluent.

#### PLANT EFFICIENCY

The influent BOD and suspended solids averaged 162 milligrams per litre and 175 milligrams per litre respectively. The effluent BOD and suspended solids averaged 38 milligrams per litre and 39 milligrams per litre respectively. These figures represent a reduction of 76 percent BOD and 78 percent suspended solids. A percentage reduction in both cases dropped somewhat compared to the 1971 reductions of 81 percent BOD and 87 percent suspended solids. Increased flows and lower influent BOD and suspended solids strengths are the cause of this reduction.

Phosphorus removal was very poor due to the hydraulic overload of the plant. At the end of the year alum was being considered rather than lime for reducing the phosphorus content at the plant.

#### SLUDGE DIGESTION AND DISPOSAL

A total of 2.39 million gallons of raw sludge containing 3.6 percent total solids was pumped to the digester. Approximately 1.43 million gallons of digested sludge containing 2.8 percent total solids were removed for disposal on land.

#### CONCLUSIONS

With the hydraulic overloading that the plant experienced the final effluent did not meet the Ministry's BOD and suspended solids standards of 15 milligrams per litre. The phosphorus removal process was ineffective as were the tube settlers in the final clarifiers, both due to hydraulic overloading. The treatment process is considered to be totally unacceptable however owing to the advent at the Central York-Pickering sewage collection and treatment system, there are no plans to enlarge the plant. Reportedly further development in the area serviced by this plant is being curtailed until the area system is available, however in observing the rate at which homes are being built in the area, it is obvious that the situation at the treatment plant will deteriorate even further.

## PROJECT COSTS

2-0040-59  
NET CAPITAL COST \$608, 711. 07

DEDUCT - Portion financed by

Long Term Debt to MOE \$608, 711. 07

Debt Retirement Balance at Credit  
(Sinking Fund) December 31, 1972 \$199, 261. 18

Net Operating \$ 46, 079. 14  
Debt Retirement 5, 205. 00  
Reserve 1, 970. 96  
Interest Charged 34, 135. 89

TOTAL \$ 87, 390. 99

### RESERVE ACCOUNT

Balance @ January 1, 1972 \$ 37, 477. 71

Deposited by Municipality 1, 970. 96

Interest Earned 2, 415. 13

\$ 41, 863. 80

Less Expenditures -

Balance @ December 31, 1972 \$ 41, 863. 80

## PROJECT COSTS

2-0224-67	
NET CAPITAL COST	\$305, 789. 81
DEDUCT - Portion financed by CMHC (Final)	(202, 047. 88)
MUNICIPAL ADVANCES	<u>(104, 100. 11)</u>
Long Term Debt to MOE	\$ <u>(358. 18)</u>
Debt Retirement Balance at Credit (Sinking Fund) December 31, 1972	
Net Operating Debt Retirement Reserve Interest Charged	\$ <u>(27. 14)</u>
TOTAL	\$ <u>(27. 14)</u>

### RESERVE ACCOUNT

Balance @ January 1, 1972

Deposited by Municipality

Interest Earned

Less Expenditures

Balance @ December 31, 1972

## PROJECT COSTS

2-0279-70	
NET CAPITAL COST	\$183,357.19
DEDUCT - Portion financed by	
MUNICIPAL ADVANCES	<u>(183,385.96)</u>
Long Term Debt to MOE	\$ (28.77)
Debt Retirement Balance at Credit (Sinking Fund) December 31, 1972	
Net Operating Debt Retirement Reserve Interest Charged	
TOTAL	

### RESERVE ACCOUNT

Balance @ January 1, 1972

Deposited by Municipality

Interest Earned

Less Expenditures

Balance @ December 31, 1972

## OPERATING COSTS

# 1972 COSTS

● PAYROLL	47 %
● FUEL	3 %
● POWER	13 %
● CHEMICALS	5 %
● GENERAL SUPPLIES	1 %
● EQUIPMENT	1 %
● REPAIRS & MAINTENANCE	6 %
● SUNDRY	23 %
● WATER	<1 %
● TRAVEL	1 %

## TOTAL ANNUAL COST

NET OPERATING	53 %
DEBT RETIREMENT	6 %
RESERVE	2 %
INTEREST	39 %

## YEARLY OPERATING COSTS

YEAR	SEWAGE TREATED in million gallons	TOTAL OPERATING COSTS	TREATMENT COSTS	
			\$ per million gal	¢ per lb BOD
1968	204.18	\$21,533.20	\$105.46	12 cents
1969	216.9	29,098.52	134.16	9 cents
1970	249.0	36,428.20	146.29	9 cents
1971	280.0	43,581.22	156.00	4 cents
1972	366. *	45,923.08	125.00	11 cents

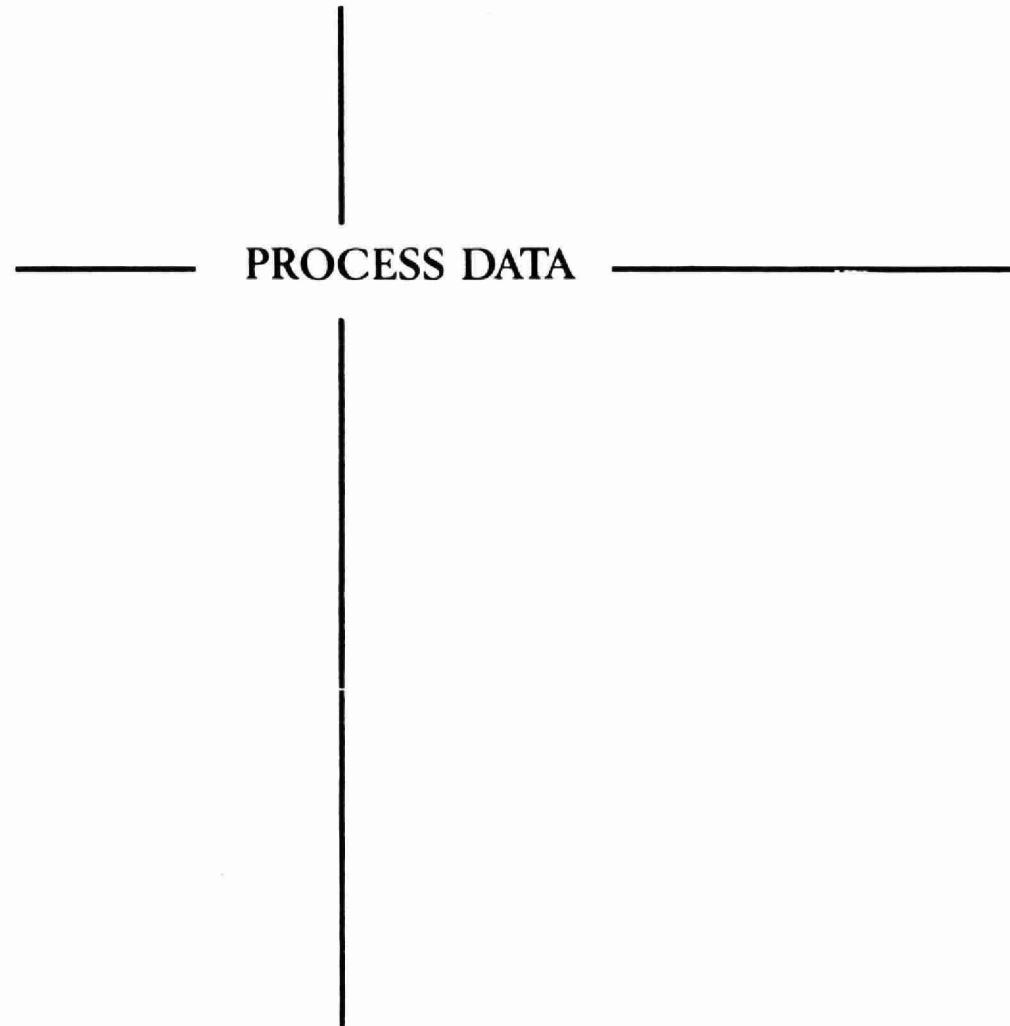
\* Estimated

## MONTHLY OPERATING COSTS

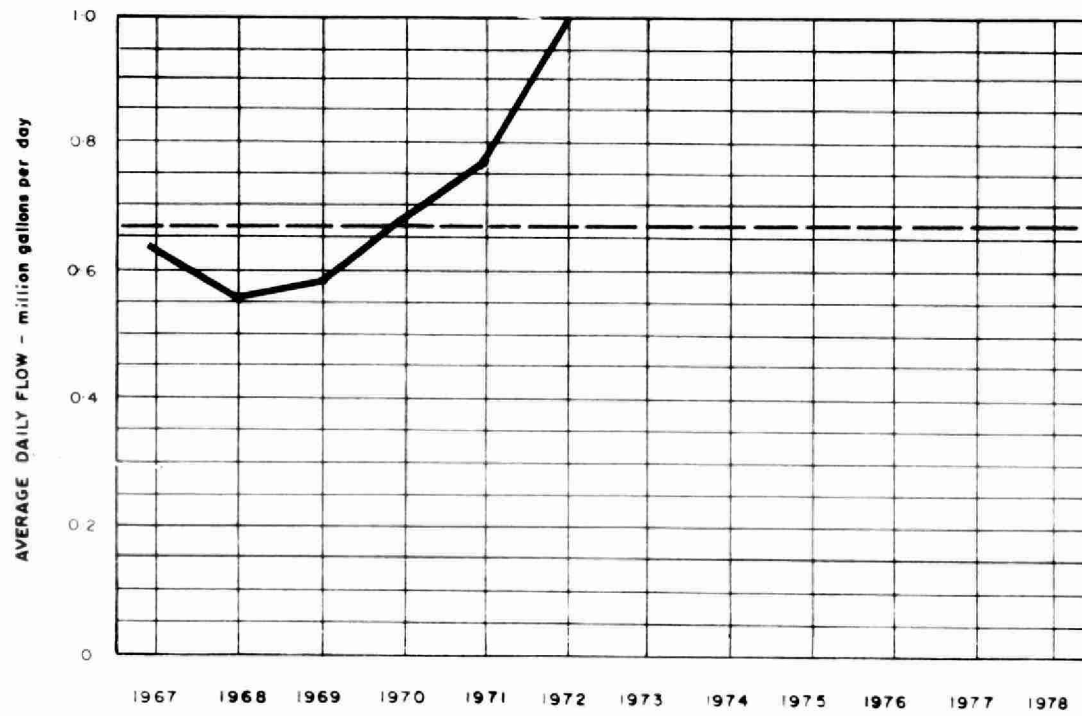
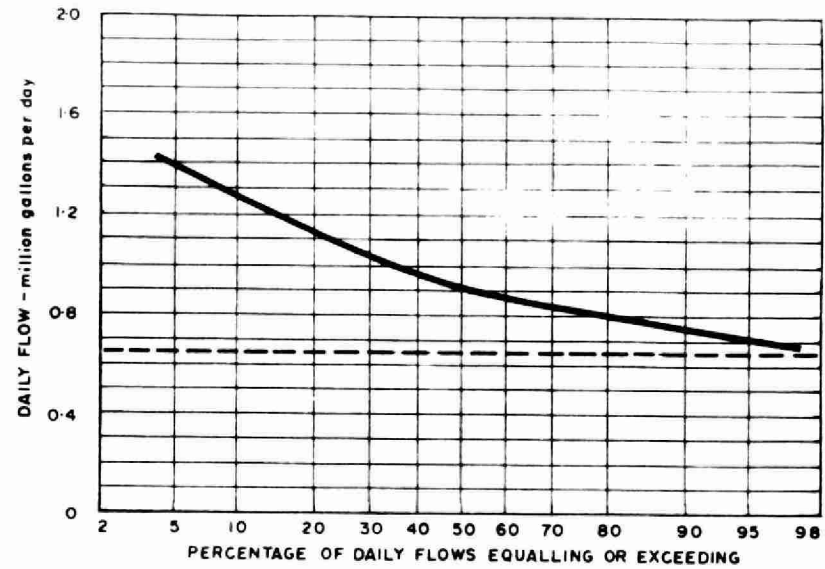
MONTH	TOTAL EXPENDITURE	REGULAR PAYROLL	CASUAL PAYROLL	FUEL	POWER	CHEMICALS	GENERAL SUPPLIES	EQUIPMENT	REPAIRS and MAINTENANCE	SUNDRY*	WATER	TRAVEL
JAN	2362.90	1568.36		289.61	504.93							
FEB	3853.43	1626.36		106.80	536.13		12.03	33.60	224.52	1266.89		47.10
MAR	3868.18	1565.32			456.03	556.50	29.50		158.90	1067.58		34.35
APR	3631.41	1596.98		288.36	465.45		158.51			975.70	37.11	109.30
MAY	3317.77	1674.02			506.15	278.25	95.19		161.21	569.50		33.45
JUNE	4109.61	2303.67		134.92	475.11		83.43		60.17	1028.31		24.00
JULY	2889.02	38.50			418.76	372.00			803.43	1142.58	89.75	24.00
AUG	2554.10	1520.06			478.65	177.00	72.21		282.44	(2.06)		25.80
SEPT	4078.46	1556.04		139.20	477.60		79.52			1800.00		26.10
OCT	3505.89	2004.35			493.46	177.00	12.50	76.65		741.93		
NOV	2177.84	77.97			482.90	177.00				1407.36	26.91	5.70
DEC	9574.47	6016.08		389.29	488.52	482.63	190.80	207.40	910.50	765.75		123.50
TOTAL	45923.08	21547.71		1348.18	5783.69	2220.38	733.69	317.65	2601.17	10763.54	153.77	453.30

Brackets indicate credit.

\* Sundry includes sludge haulage costs of \$10,035.00



# FLOWS



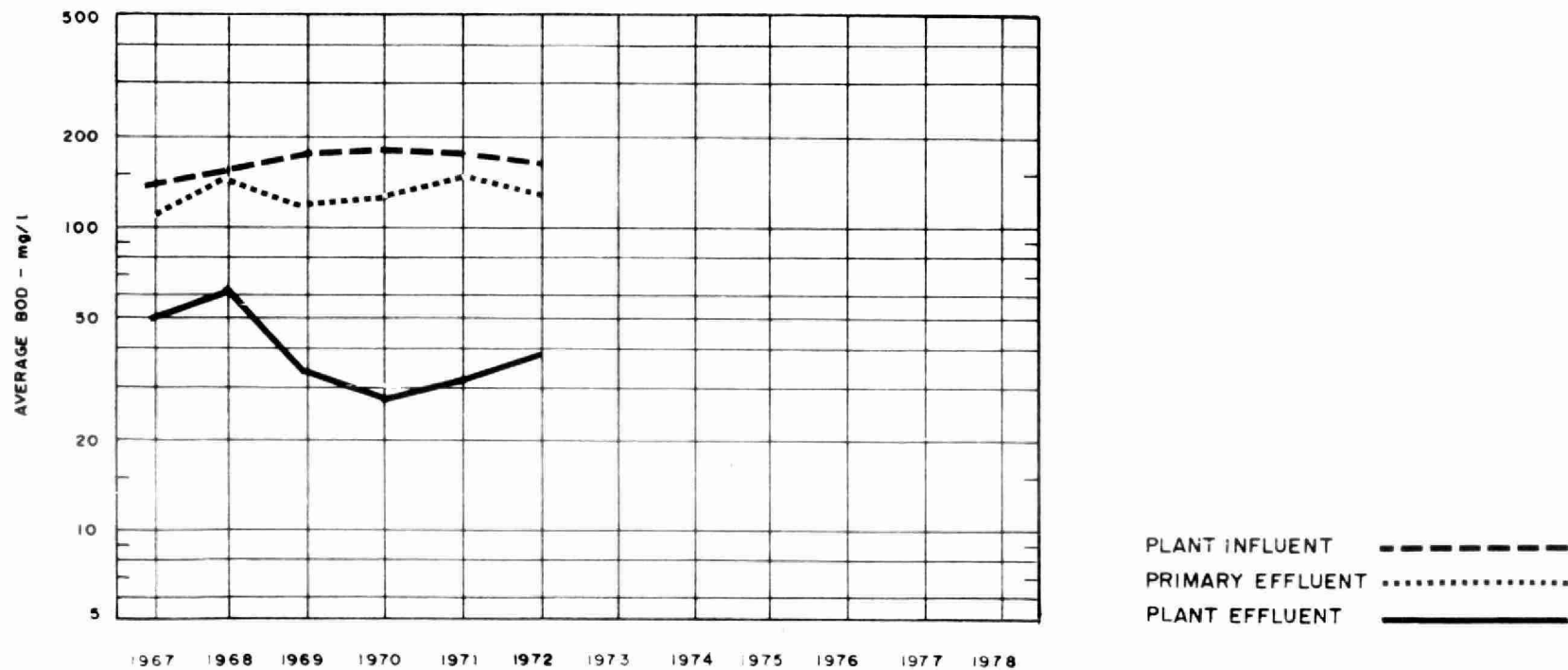
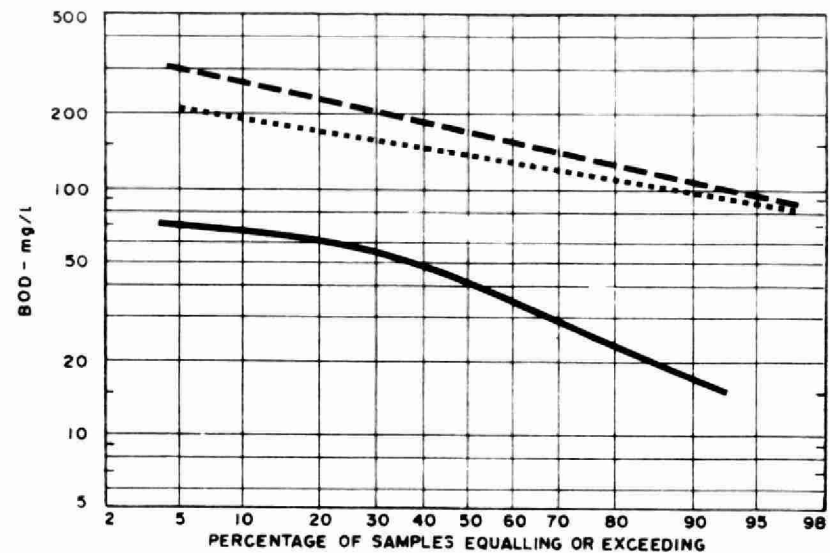
DESIGN CAPACITY — — — — —



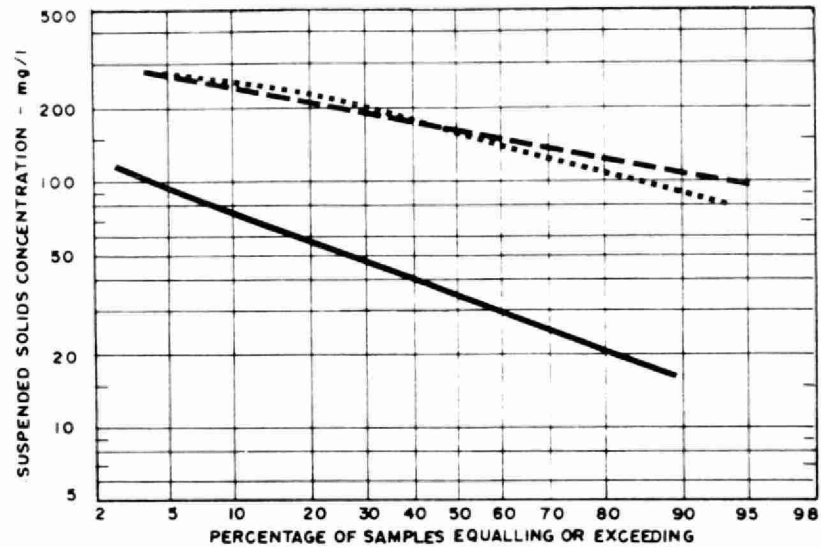
## PLANT PERFORMANCE

MONTH	FLOWS			BIOCHEMICAL OXYGEN DEMAND				SUSPENDED SOLIDS				PHOSPHORUS	
	TOTAL FLOW million gallons	AVERAGE DAY mil. gal	MAXIMUM DAY mgd	INFLUENT mg/l	EFFLUENT mg/l	REDUCTION		INFLUENT mg/l	EFFLUENT mg/l	REDUCTION		INFLUENT mg/l P	EFFLUENT mg/l P
						%	10 <sup>3</sup> pounds			%	10 <sup>3</sup> pounds		
JAN	26.6	.85	1.15	175	37	79	37	182	30	84	41	9.9	5.1
FEB	23.8	.83	1.00	180	55	69	30	160	57	64	24	12.0	8.2
MAR	24.7	.80	1.56	160	60	63	24	240	75	69	41	8.5	5.0
APR	43. (est)	1.44	2.00	70	70	0	0	140	55	61	37	6.4	3.5
MAY	30.3	.97	1.90	160	33	79	38	163	43	74	36	11.1	6.5
JUNE	23.1	.77	1.00	300	50	83	58	100	60	40	9	11.0	7.6
JULY	-	-	-	210	42	80	-	205	20	90	-	12.0	7.6
AUG	-	-	-	170	39	77	-	175	30	83	-	12.0	8.3
SEPT	-	-	-	130	10	92	-	210	10	95	-	13.0	9.0
OCT	-	-	-	135	14	90	-	150	10	93	-	10.8	7.5
NOV	28. (est)	.96	1.14	125	33	74	27	140	38	73	29	10.9	6.3
DEC	31.4	1.01	1.32	135	47	65	28	240	65	73	55	7.9	5.5
TOTAL	-	-	-	-	-	-	-	-	-	-	-	-	-
AVG.	-	1.00	MAXIMUM 2.00	162	38	76	35	175	39	78	34	10.6	6.7
No. of Samples	-	-	-	21	20	-	-	21	21	-	-	21	21

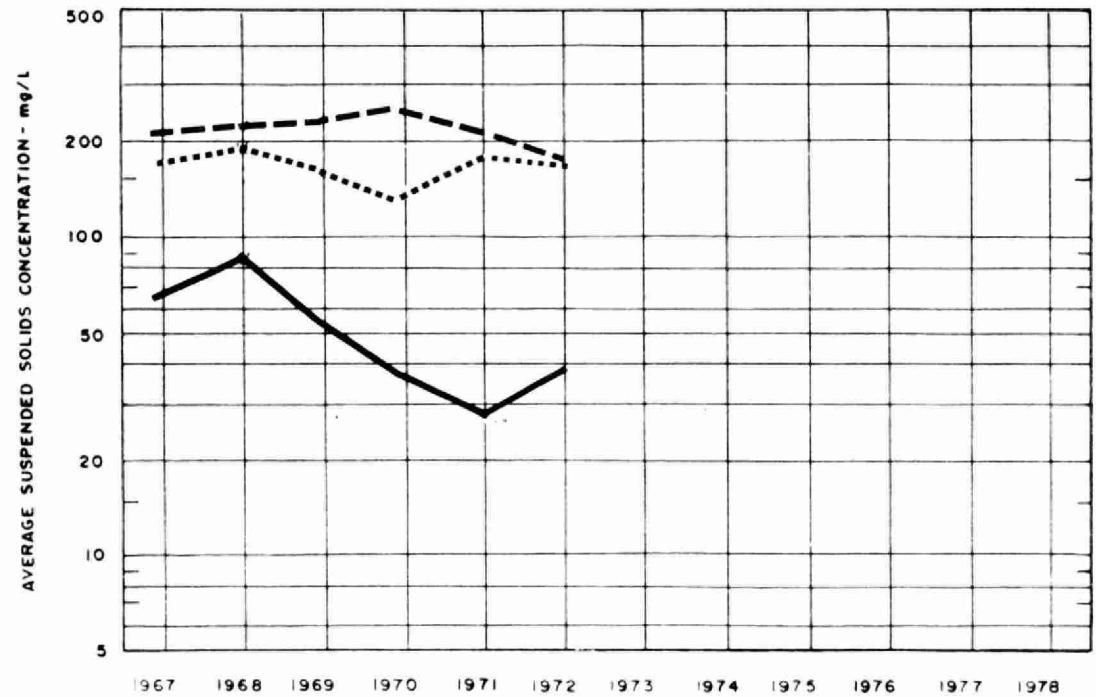
# BIOCHEMICAL OXYGEN DEMAND



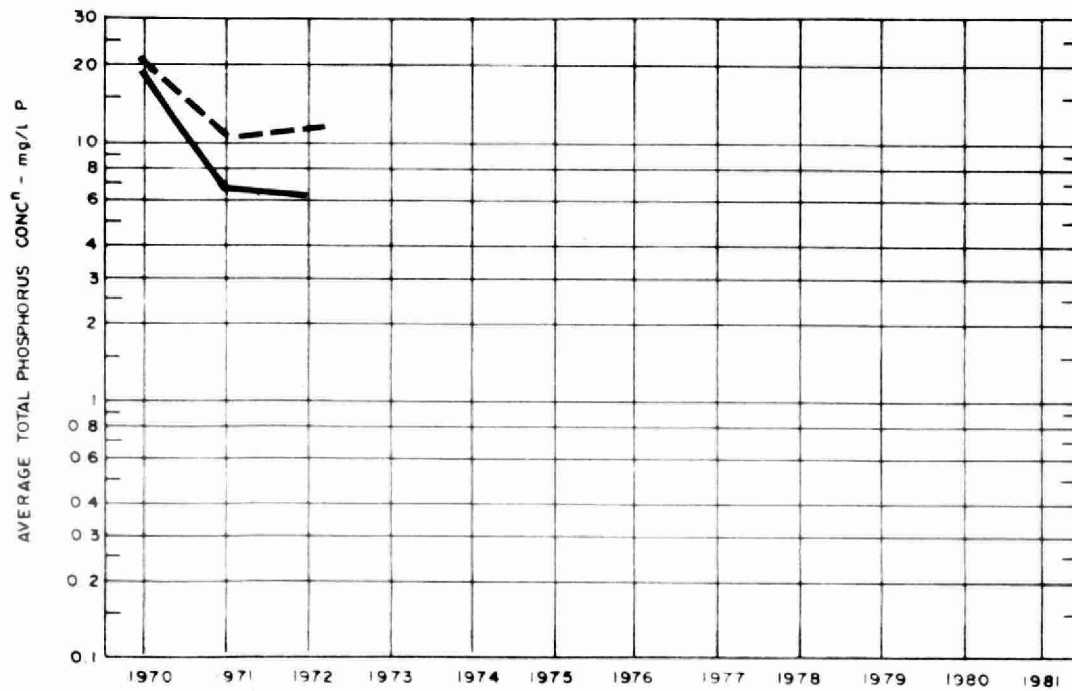
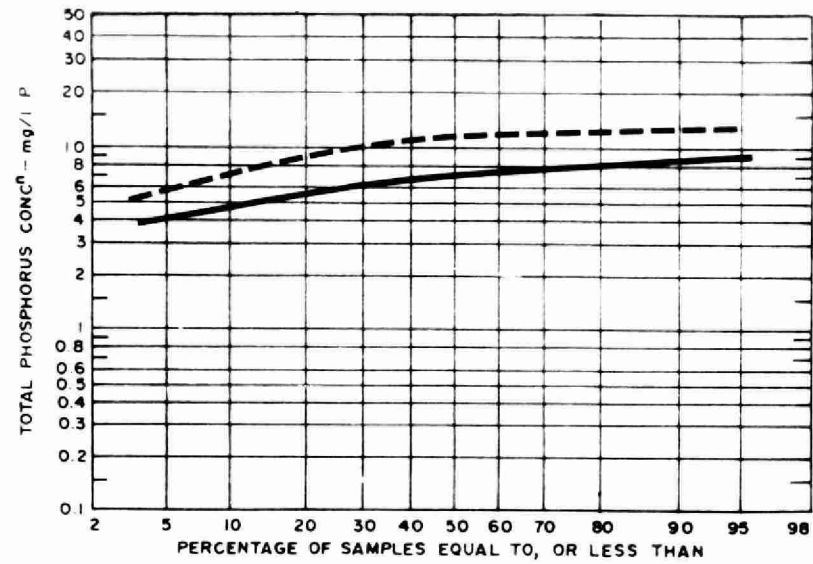
# SUSPENDED SOLIDS



PLANT INFLUENT      - - - - -  
 PRIMARY EFFLUENT    .....  
 PLANT EFFLUENT      \_\_\_\_\_



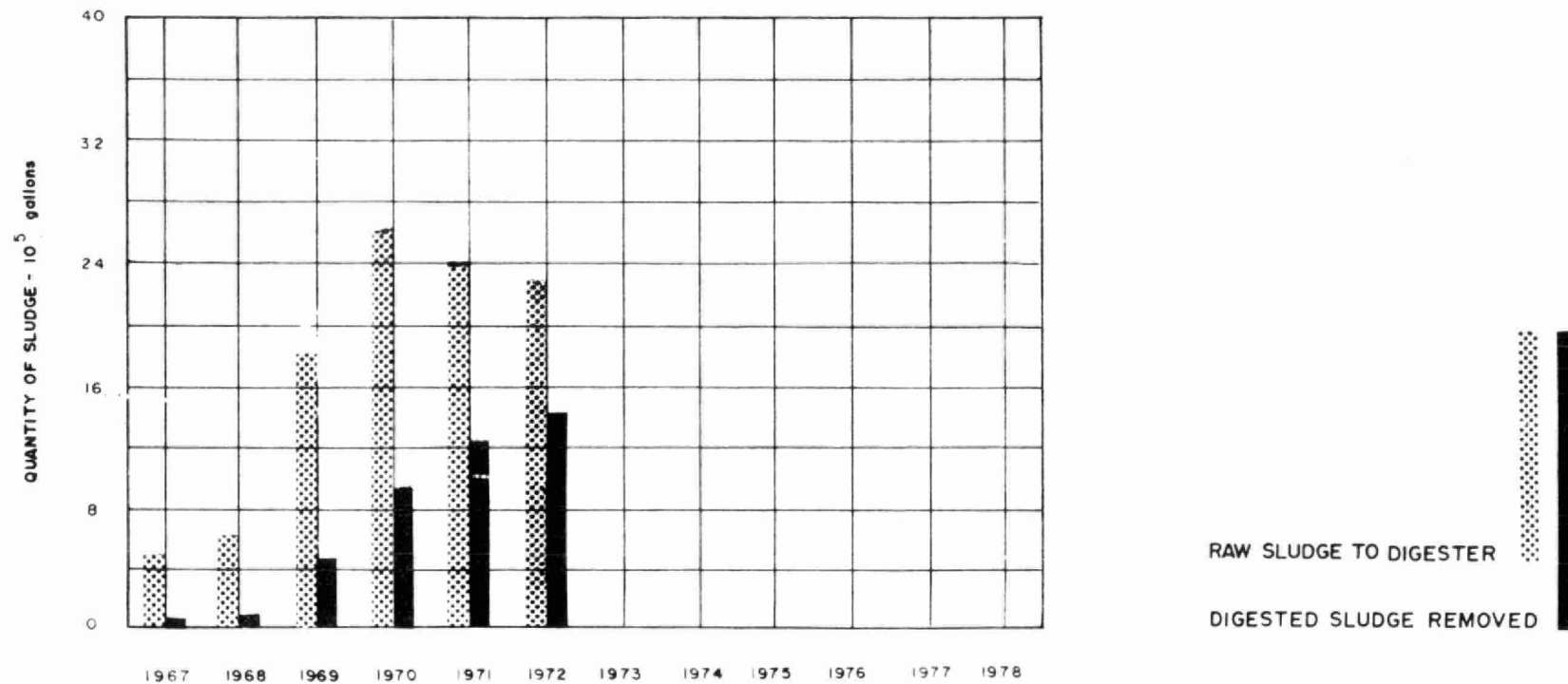
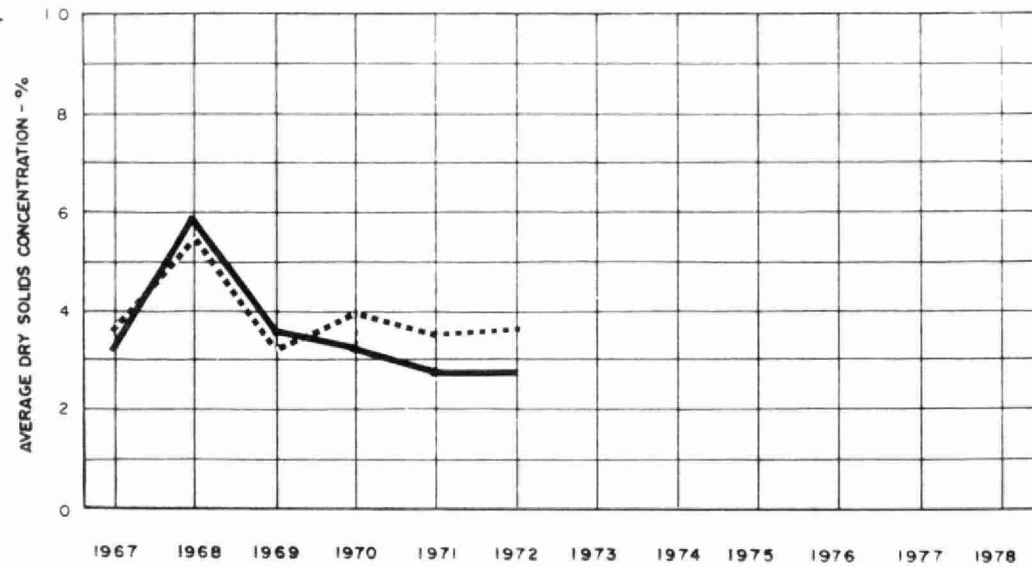
# PHOSPHORUS



PLANT INFLUENT    - - - - -  
PLANT EFFLUENT    —————

# DIGESTION

RAW SLUDGE .....  
DIGESTED SLUDGE —————



## TREATMENT DATA

MONTH	GRIT	CHLORINATION		PRIMARY EFFLUENT		AERATION			SLUDGE DIGESTION and DISPOSAL							
	QUANTITY REMOVED cubic feet	CL <sub>2</sub> USED 10 <sup>3</sup> pounds	AVG. DOSE mg/l	BOD mg/l	SUSPENDED SOLIDS mg/l	MLSS CONC mg/l	F/M day <sup>-1</sup>	AIR 1000 ft <sup>3</sup> lb BOD	RAW SLUDGE			DIGESTED SLUDGE			SUPER- NATANT T. S. %	AMOUNT HAULED cubic yards
									QUANTITY 5 10 gallons	TOTAL SOLIDS %	VOL. SOLIDS %	QUANTITY 5 10 gallons	TOTAL SOLIDS %	VOL. SOLIDS %		
JAN	65	1.14	4.3	140	125	1800	.22	2.5	2.33	3.1	70	1.66	2.3	52		1043
FEB	95	1.19	5.0	160	125	2100	.21	4.1	2.01	2.7	79	1.32	2.0	51		780
MAR	50	1.25	5.1	140	230	2100	.18	2.2	2.09	6.0	59	1.28	2.4	49		761
APR	105	1.38	3.2	60	150	2100	.08	4.9	1.59	5.3	44	.74	4.1	38		438
MAY	70	1.36	4.5	140	200	1700	.22	2.4	1.96	2.5	73	1.34	2.9	59		795
JUNE	57	1.23	5.3	120	240	2100	.16	1.6	1.75	2.4	68	1.48	2.7	55		878
JULY	105	1.24	-	145	130	1400	.27	2.5	1.89	3.1	70	1.24	4.2	44		736
AUG	82	1.20	-	145	140	1300	.31	2.2	1.80	3.5	65	1.16	2.7	48		689
SEPT	80	1.21	-	95	110	1500	.17	3.1	1.94	3.4	77	.96	2.9	37		569
OCT	120	1.33	-	150	200	2700	.15	1.8	2.40	3.4	69	1.06	2.4	55		627
NOV	75	1.12	3.9	140	205	1200	.32	1.9	2.10	3.7	64	1.16	3.1	53		687
DEC	100	1.30	4.1	125	200	600	.53	2.4	2.03	4.0	60	.88	2.8	52		522
TOTAL	1004	14.95	-	-	-	-	-	-	23.89	-	-	14.28	-	-	-	8525
AVG.	2.7 cu ft/mil gal	1.25	4.1	130	171	1700	.24	2.4	1.99	3.6	67	1.19	2.8	49		710

Aeration flow estimated as 0.66 IMGD.

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